Central Puget Sound
Regional Fare Coordination System

KT Installation Procedure - MCI Worker Driver

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1 Introduction

This is an Installation Procedure manual for the MCI Worker Driver bus at Kitsap Transit (KT). It is intended to show the installation technician(s) where and how to mount all devices that are part of the RFCS, and install all cabling required to ensure correct and reliable system operation.

There are six pieces of equipment that make up the RFCS installation on the bus.

- **The On-Board Fare Transaction Processor (OBFTP):** This is the master device in the system; it is the device that contains the smart card reader and is the interface to the customer.
- **The Driver Display Unit (DDU):** This device provides an interface to the Operator. It is used to input such information as passenger counts, route information, and other data, as well as display messages on screen for operator viewing.
- **The Wireless Data On/Off Loading System (WDOLS):** This is the device that changes the data from a Category 5 input to a 2.4GHz wireless signal and vice versa. There are two parts to the WDOLS system:
  - The power injector - both the Ethernet and power cables plug into this unit as inputs. The outputs of this unit power the Cisco 1310 Bridge/Access Point.
  - The Cisco 1310 Access Point/Bridge - the power injector cables plug into the inputs to this unit. The antenna (see below) plugs directly to the output of the unit (reverse BNC).
- **The Antenna:** An upgraded external antenna is fitted to the WDOLS unit to allow for an omni-directional signal to be transmitted and received.
- **The Ethernet Switch:** This small device acts as a junction for the three Category 5 cables that come from the OBFTP, DDU, and WDOLS. The above devices are connected together using Category 5 cabling.
- **The Load Dump Module (LDM):** This device provides protection to the equipment from voltage transients and spikes that may be caused by the bus electrical system.

1.1 Purpose

The purpose of this installation guide is to describe the position and methods of mounting the above devices. It will clearly show how and where all necessary cabling will be installed for correct and reliable operation.

1.2 Overview

The locations detailed herein, drawings, and photographs will serve to describe to the installer the following:

- Where and how to mount the equipment
- The location of attachment points for power
- All details on cable connectors in the Installation Connectivity Matrix
- All details on cable routing

1.3 Terminology

This section contains a list of acronyms, abbreviations, and terms used in this document.

Table 1 contains the acronyms and abbreviations that are specific to ERG. Industry standard acronyms and abbreviations are not defined in this table.

Table 1: Acronyms and Abbreviations

Acronym or Abbreviation	Definition
RFCS	Regional Fare Coordination System
ERG	ERG Transit Systems (USA) Inc.
DDU	Driver Display Unit
KT	Kitsap Transit
LDM	Load Dump Module
OBFTP	On-Board Fare Transaction Processor
WDOLS	Wireless Data On/Off Loading System

1.4 References

[1] Contract 229944, as amended and conformed

[2] SEA-02088 Generic On-Board Installation Instruction

[3] SEA-07135 Kitsap Transit-Bill of Materials

2 Device Installation Procedures – MCI Worker Driver

All Worker Driver MCI buses at KT have the same installation procedures. The position and method for mounting the devices and antenna, and for running all the cables, are the same.

2.1 Driver Display Unit (DDU) Mounting

The DDU is mounted to a steel plate and housed in the empty dash cavity as shown in Figure 1. KT has manufactured a suitable mount to secure the DDU in place.

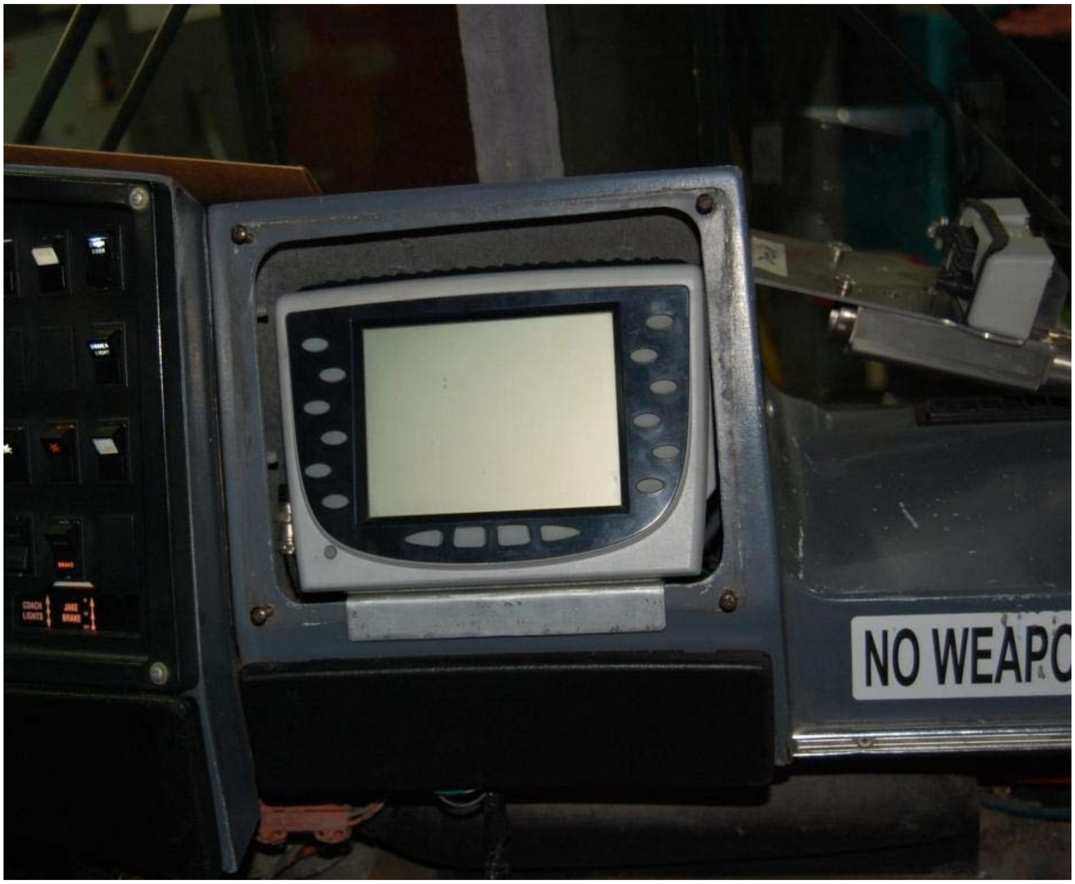

Figure 1: DDU Location

2.1.1 DDU Bracket and Cradle Installation

2.1.1.1 Fitting DDU Bracket to DDU mount

Secure the DDU bracket to the DDU mount through pre-drilled holes, using M5x20 countersunk screws and nyloc nuts.

2.1.1.2 Fitting DDU Cradle to DDU Bracket

1. Seat the DDU cradle onto the DDU plate. The plate is pre-drilled to make installation easier. The DDU cradle holes should match with the DDU bracket plate holes.
2. Secure the DDU cradle to the top plate with M5x20 countersunk screws and nyloc nuts.

2.1.1.3 DDU Installation to DDU Cradle

Place the DDU onto the DDU cradle as shown in Figure 1. Lock the DDU to the cradle using the key provided. Insert the DDU in to the dash cavity and secure the mount to the dash with tapping screws.

2.2 On-Board Fare Transaction Processor (OBFTP) Mounting

The OBFTP will be mounted to the dash (see Figure 2). The OBFTP will be secured to the dash with a 4-hole stainless steel cup and held in place with bolts, nylock nuts, and fender washers. The cabling for the device runs through the vertical stanchion and base clamp into the dash cavity.

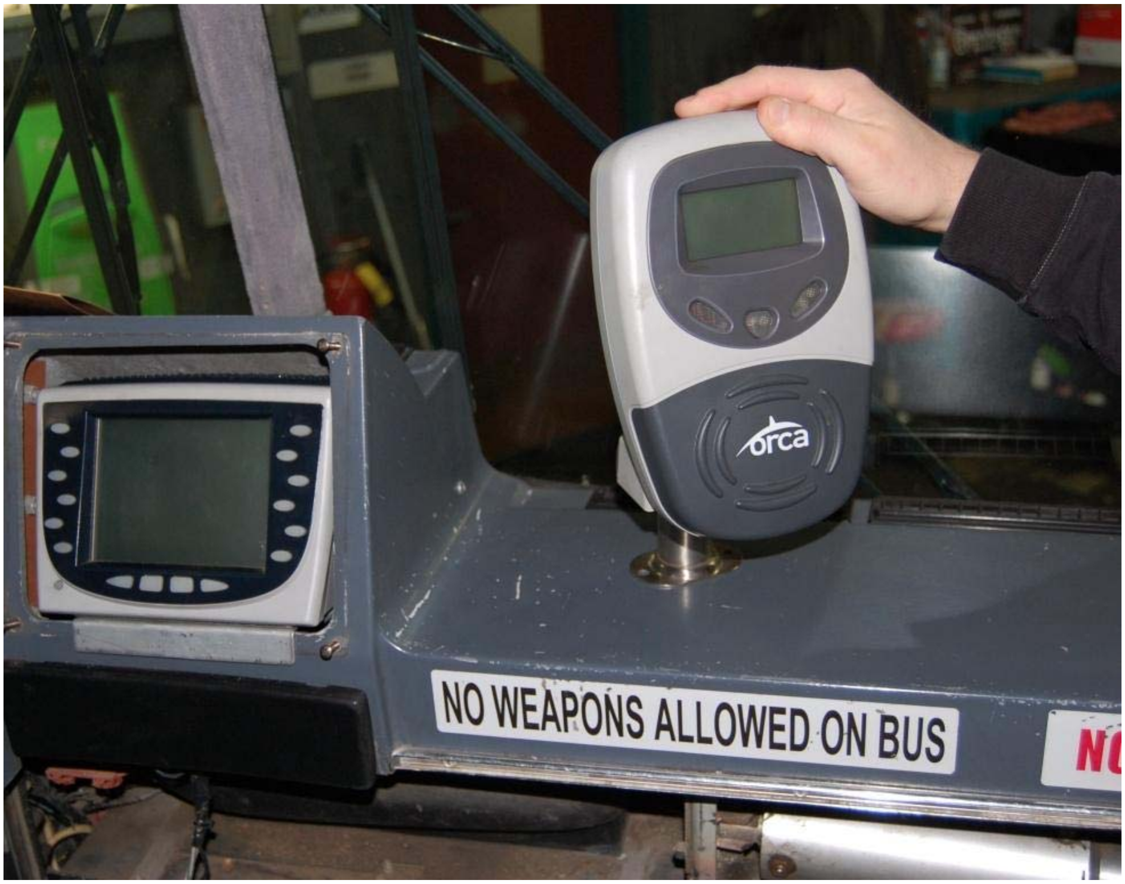

Figure 2: OBFTP Location

2.2.1 OBFTP Bracket/Cradle Mounting

2.2.1.1 Fitting OBFTP Bracket to Vertical Stanchion

1. Remove the center locating screw from the OBFTP bracket. Insert a 7-inch vertical stanchion into the base clamp until it will not go any farther. Fit the OBFTP bracket to the vertical stanchion. The bottom of the OBFTP bracket should touch the top of the base clamp, i.e., the OBFTP bracket should sit as low on the stanchion as possible.
2. Mark the location of the hole for the locating screw to bolt into the stanchion by punching a mark through the hole as shown in Figure 3.
3. Mark the location for the hole where the cable will exit the vertical section and enter the OBFTP bracket by punching a mark in the center of the cutout of the bracket.
4. Mark the hole in the stanchion for the bolt to go through.
5. Remove the vertical stanchion from the base clamp. Position the base clamp on the dash panel.
6. Mark four holes in the dash for bolts. Mark the hole in the center of the base clamp for the cables to pass through into the dash.

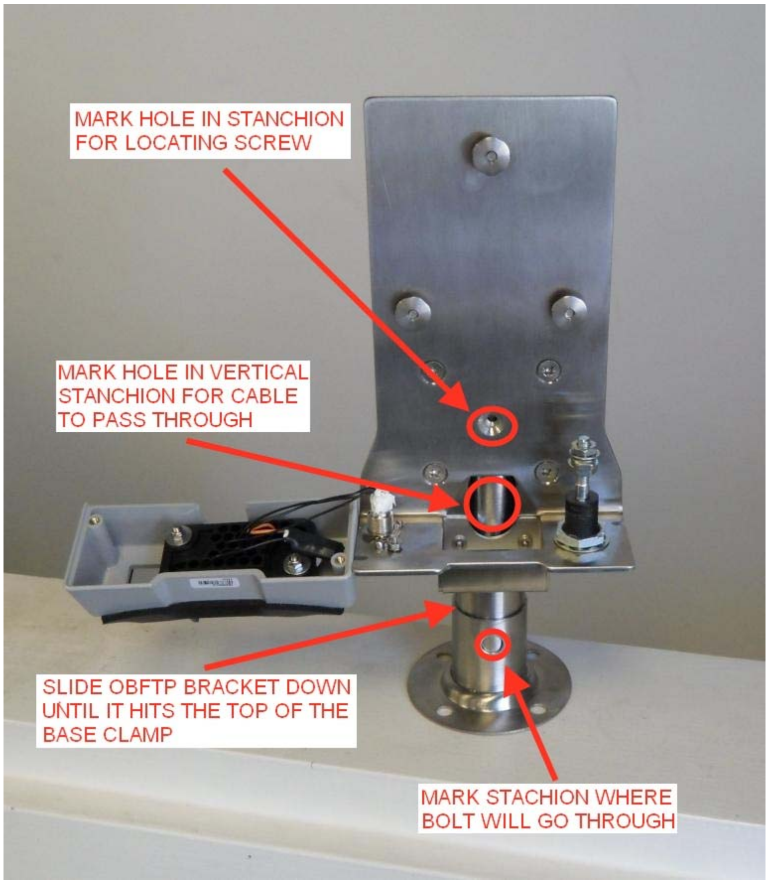
MARK HOLE IN STANCHION FOR LOCATING SCREW
MARK HOLE IN VERTICAL STANCHION FOR CABLE TO PASS THROUGH
SLIDE OBFTP BRACKET DOWN UNTIL IT HITS THE TOP OF THE BASE CLAMP
MARK STACHION WHERE BOLT WILL GO THROUGH

Figure 3: OBFTP Mounting Bracket Detail

7. Drill the required holes:
    a. Drill a 13/64” hole through the vertical stanchion where the locating screw will penetrate the vertical hand rail.

b. Drill a 3/4” hole in the forward side of the vertical stanchion where indicated to allow cables through. De-bur and insert the grommet edging provided.

c. Drill an 11/16” hole in the overhead fiberglass panel to allow cables to enter the roof cavity.

d. Drill an 11/16” hole in the overhead panel clamp to allow cables to pass through and enter the roof cavity. Fit grommet edging to the clamp.

e. Drill four ¼-inch holes for bolts to mount the base clamp to the dash.

Note: Do not assemble the vertical stanchion assembly or the OBFTP bracket until the cabling to the OBFTP bracket is complete (see cabling procedures in section 3).

2.2.1.2 Fitting OBFTP to Bracket

Fit the OBFTP to the OBFTP bracket as shown in Figure 2 and secure the device using the key provided.

2.3 WDOLS and Antenna Mounting

The WDOLS will be mounted in the overhead compartment and secured with four Z-clamps. The Z-clamps will be secured with tapping screws. The antenna will mount on the roof of the bus near the forward end of the overhead compartment.

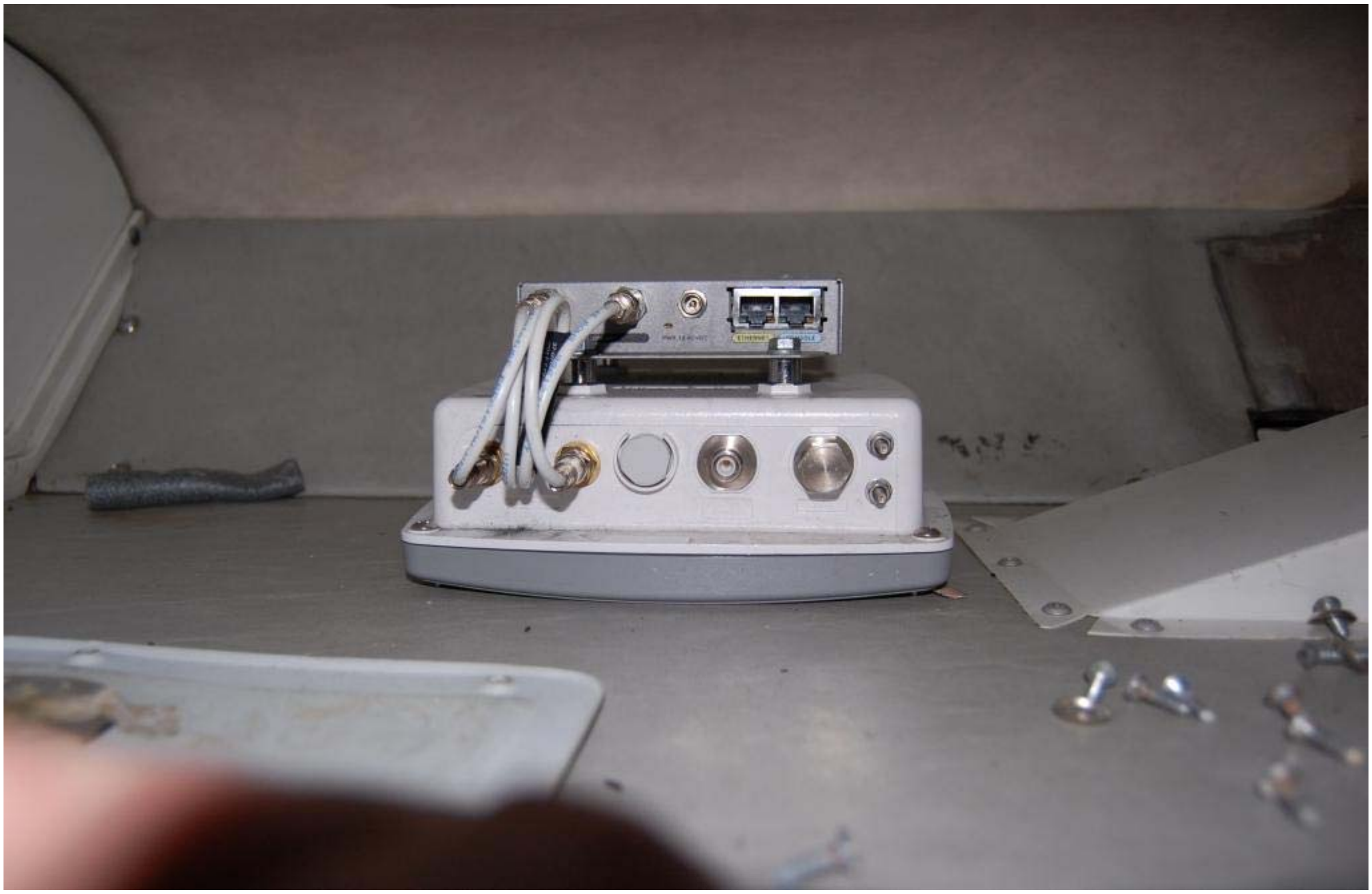

Figure 4: WDOLS Location

2.3.1 Antenna Mounting

The antenna will mount on the roof of the bus. The antenna will route from the WDOLS through the space in the overhead compartment as Figure 5 shows.

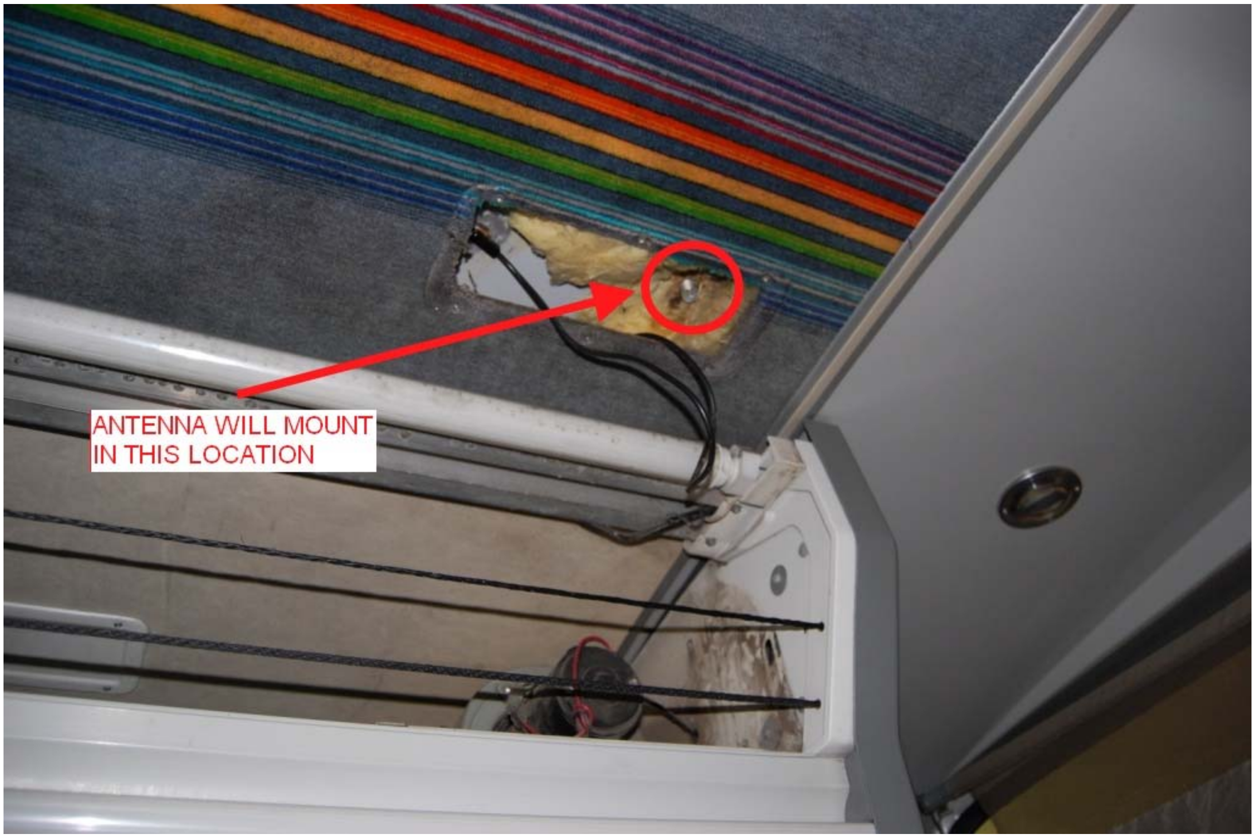

Figure 5: External Antenna Location

2.3.1.1 Installation of Antenna

1. Carefully mark a circle in the roof with a marker. Punch a mark.
2. Drill a 5/8" hole through the roof of the bus. Use a pilot drill where necessary.
3. From the roof of the bus, de-bur the hole with a de-burring tool or round file. Insert the antenna cable through the hole and feed through until the antenna sits firmly against the roof. Ensure that the rubber seal on the bottom of the antenna is intact. Seal the antenna using appropriate sealer.
4. Slide the lock washer and then the nut over the cable end and run along cable to the antenna thread. Tighten the nut.

2.3.1.2 Installation of Ethernet Switch

The Ethernet Switch will mount in the electrical panel on the outside of the bus. The Ethernet switch bracket will be secured with tapping screws as shown in Figure 6.

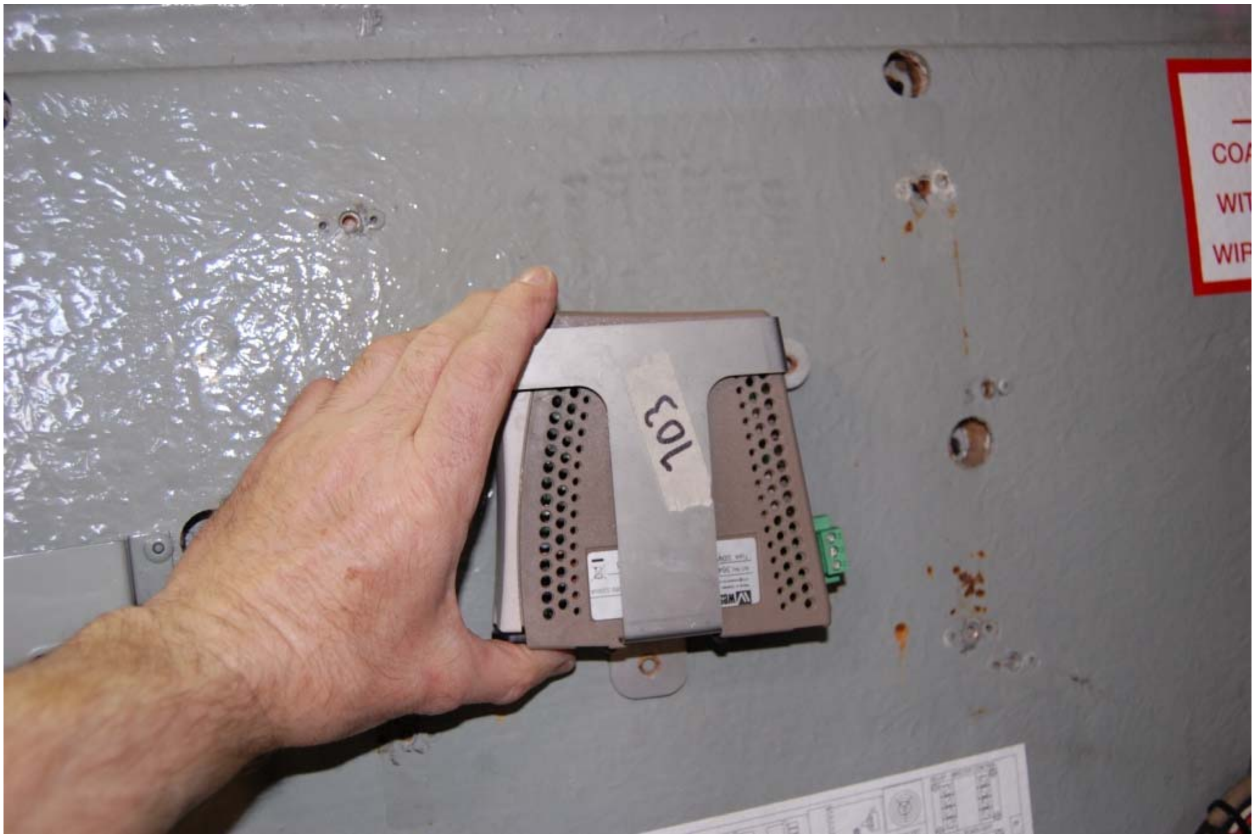

Figure 6: Ethernet Switch mounting

2.4 Load Dump Module (LDM) Mounting

The LDM is secured by two screws.

1. Position the LDM as shown in Figure 7.
2. Mount the LDM with two 1-1/2” stainless steel tapping screws.

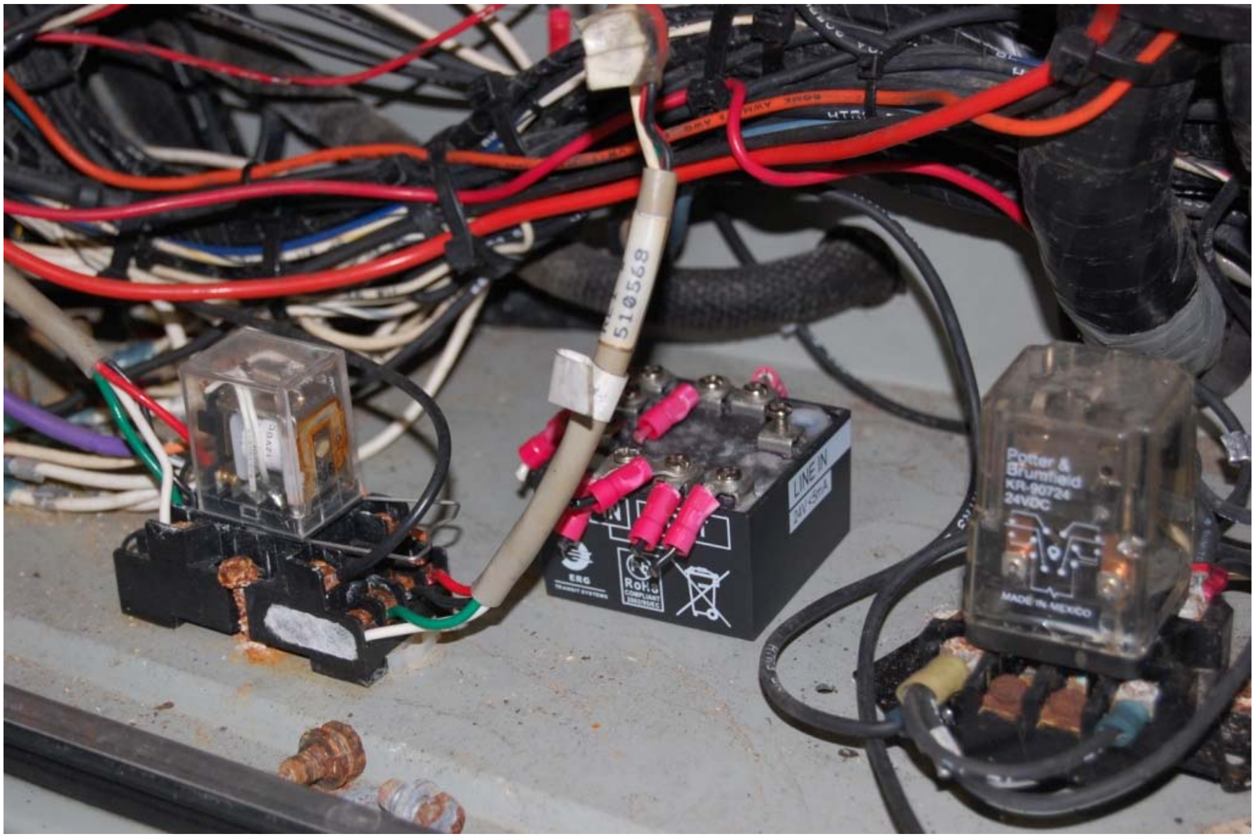

Figure 7: Load Dump Module Mounting Location

3 Cabling Installation Procedures – MCI Worker Driver

All MCI Worker Driver buses at KT share the same cabling requirements for power and communications.

Power Cable Lengths:

Circuit Breaker to LDM	2 ft
DDU to LDM	8 ft
OBFTP to LDM	8 ft
WDOLS to LDM	12 ft

Ethernet Cable Lengths:

DDU to Ethernet Switch	8 ft
OBFTP to Ethernet Switch	8 ft
WDOLS to Ethernet Switch	13 ft

Antenna Cable Length (supplied with antenna): 6 ft

3.1 Circuit Breaker and Load Dump Module Installation

Two circuit breakers will be fitted to the bus. One breaker is fitted to the constant +24V rail, and the other breaker is fitted to the ignition (switched) +24V rail. Figure 8 shows where the power and ground will be taken to supply power to the LDM. Power for the DDU, OBFTP, WDOLS, and Ethernet Switch are taken from connections on the LDM. Figure 9 shows the wiring of the LDM.

1. Install the cable to the power stud locations shown in Figure 8 using ring terminals.
2. Install the cable to ground from the location.
3. Secure the Circuit Breaker mounting block with two tapping screws.
4. Insert the constant power cable into the 4-amp breaker and ignition power into the 1-amp breaker.
5. Terminate power connections to the LDM with ring terminals as shown in Figure 9.

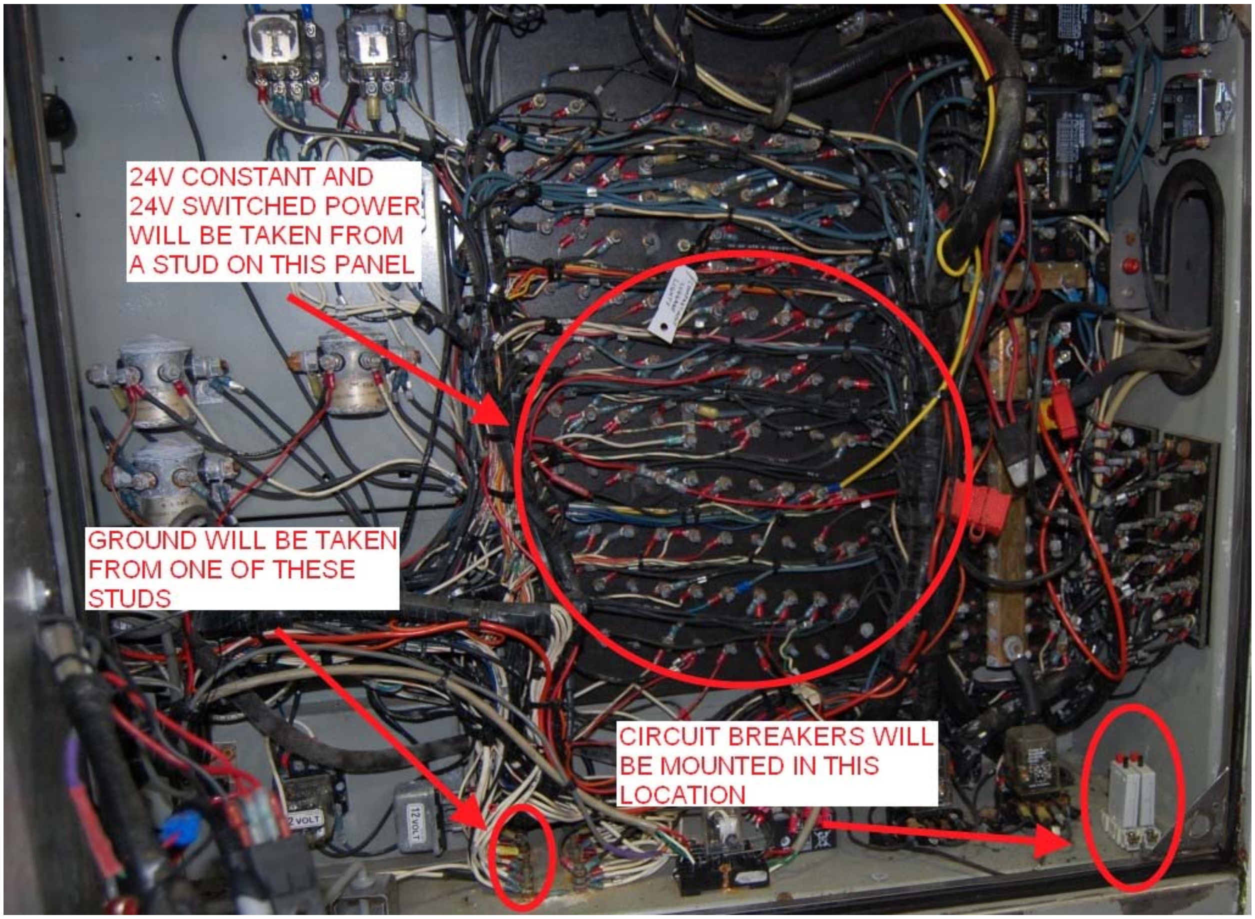
24V CONSTANT AND 24V SWITCHED POWER WILL BE TAKEN FROM A STUD ON THIS PANEL
GROUND WILL BE TAKEN FROM ONE OF THESE STUDS
CIRCUIT BREAKERS WILL BE MOUNTED IN THIS LOCATION
12 VOLT
12 VOLT

Figure 8: Power Stud Locations

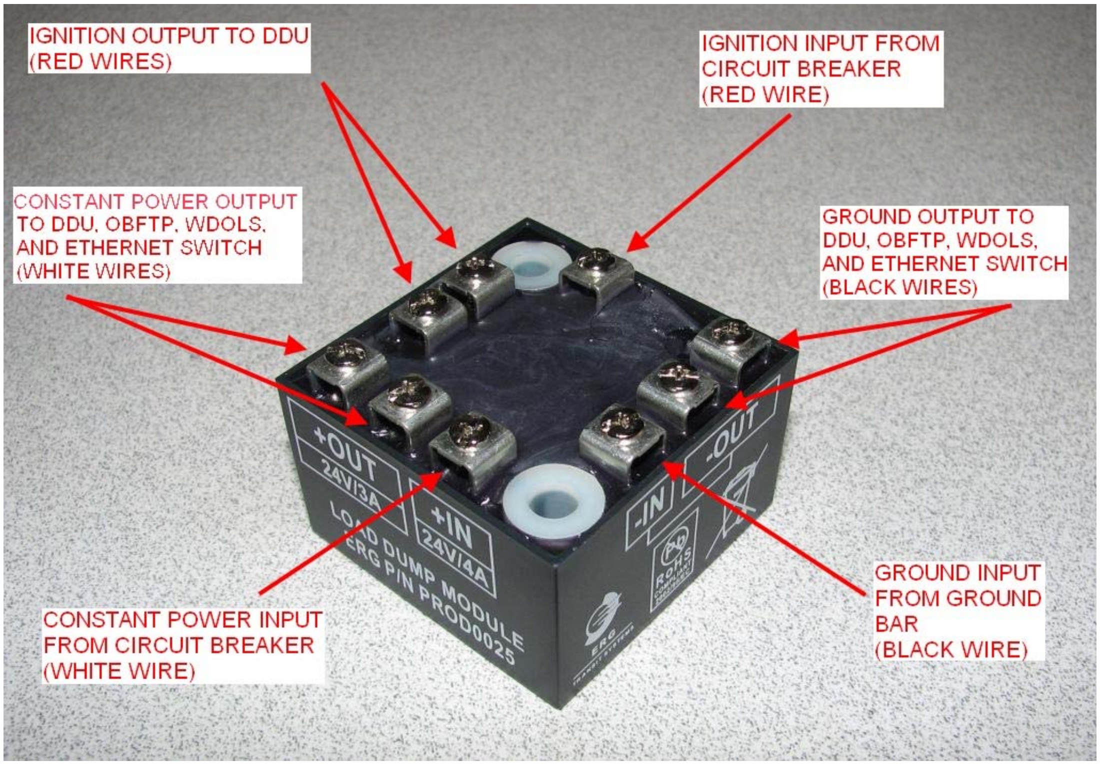
IGNITION OUTPUT TO DDU (RED WIRES)
IGNITION INPUT FROM CIRCUIT BREAKER (RED WIRE)
CONSTANT POWER OUTPUT TO DDU, OBFTP, WDOLS, AND ETHERNET SWITCH (WHITE WIRES)
GROUND OUTPUT TO DDU, OBFTP, WDOLS, AND ETHERNET SWITCH (BLACK WIRES)
+OUT 24V/3A
+IN 24V/4A
-IN
-OUT
LOAD DUMP MODULE ERG P/N PROD0025
CONSTANT POWER INPUT FROM CIRCUIT BREAKER (WHITE WIRE)
GROUND INPUT FROM GROUND BAR (BLACK WIRE)

Figure 9: LDM Wiring Diagram

3.2 DDU Cabling Installation

3.2.1 Power and Ethernet Cabling

Run both of the cables (power and Ethernet) through three feet of solid loom from the DDU bracket to the electric panel. Ensure that the cables are tied to existing looms and anchored as necessary.

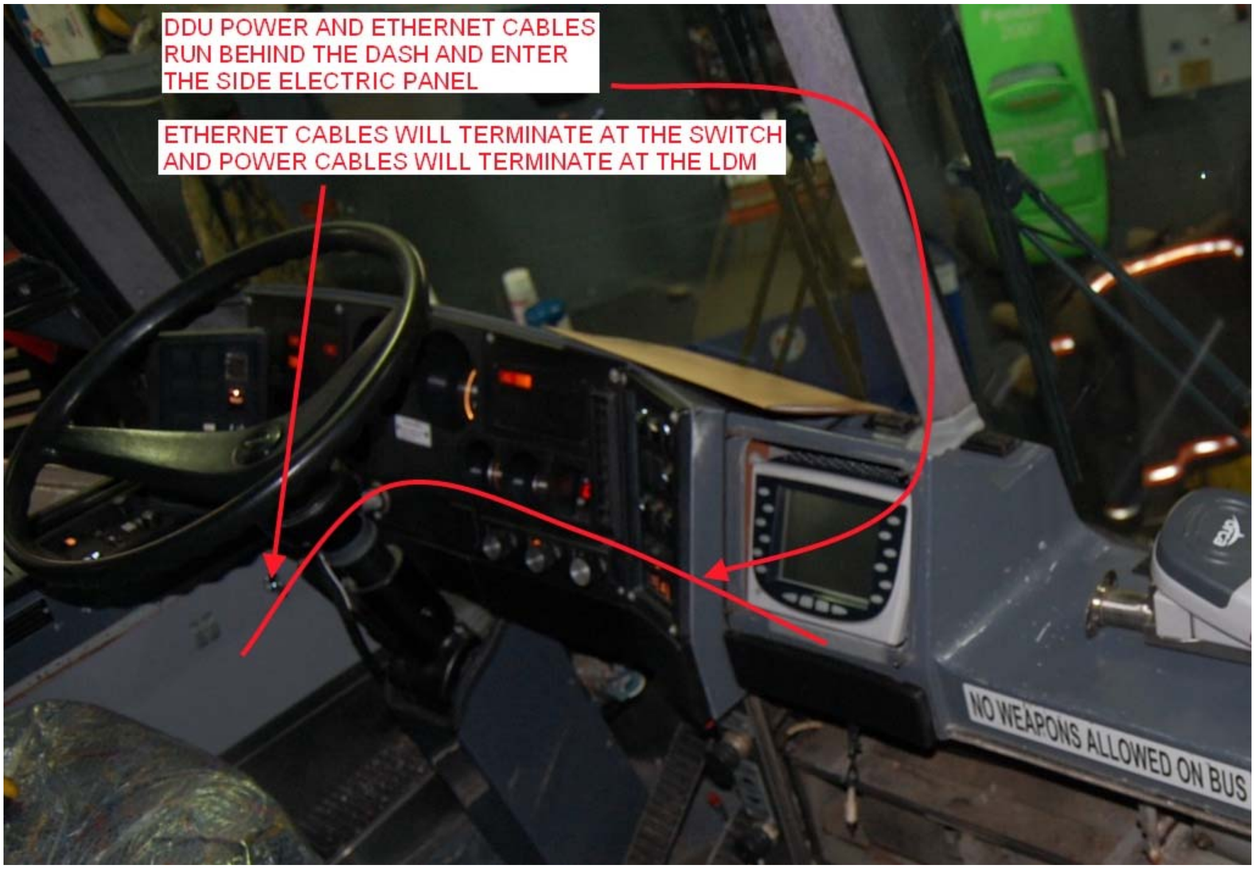
DDU POWER AND ETHERNET CABLES RUN BEHIND THE DASH AND ENTER THE SIDE ELECTRIC PANEL
ETHERNET CABLES WILL TERMINATE AT THE SWITCH AND POWER CABLES WILL TERMINATE AT THE LDM
NO WEAPONS ALLOWED ON BUS

Figure 10: DDU Power and Ethernet Cable Routing

1. Run the power and Ethernet cable underneath the dash and across to the driver side of the bus. The cables run from the DDU to the electric panel (Figure 10).
2. Continue to route the Ethernet cable into panel where the connection is made to the Ethernet Switch. Power will continue to the lower corner of the panel and connect to the LDM.
3. Terminate the Ethernet cable as described in SEA-02088 Generic On-Board Installation Instruction [2].
4. Terminate the power and Ethernet cable at the DDU cradle as described in SEA-02088 Generic On-Board Installation Instruction.

3.3 OBFTP Cabling Installation

As described in section 2.2.1.1, the cables should be run for the OBFTP before the vertical stanchion and OBFTP bracket are secured.

3.3.1 Power and Ethernet Cabling

1. Run the power and Ethernet cable underneath the dash and across to the driver side of the bus. The cables run from the OBFTP to the electric panel (Figure 11).
2. Continue to route the Ethernet cable into the panel where the connection is made to the Ethernet Switch. Power will continue to the lower corner of the panel and connect to the LDM.

3. Terminate the Ethernet cable to the Ethernet Switch as described in SEA-02088 Generic On-Board Installation Instruction [2].
4. Terminate the power and Ethernet cable at the OBFTP cradle as described in SEA-02088 Generic On-Board Installation Instruction [2].

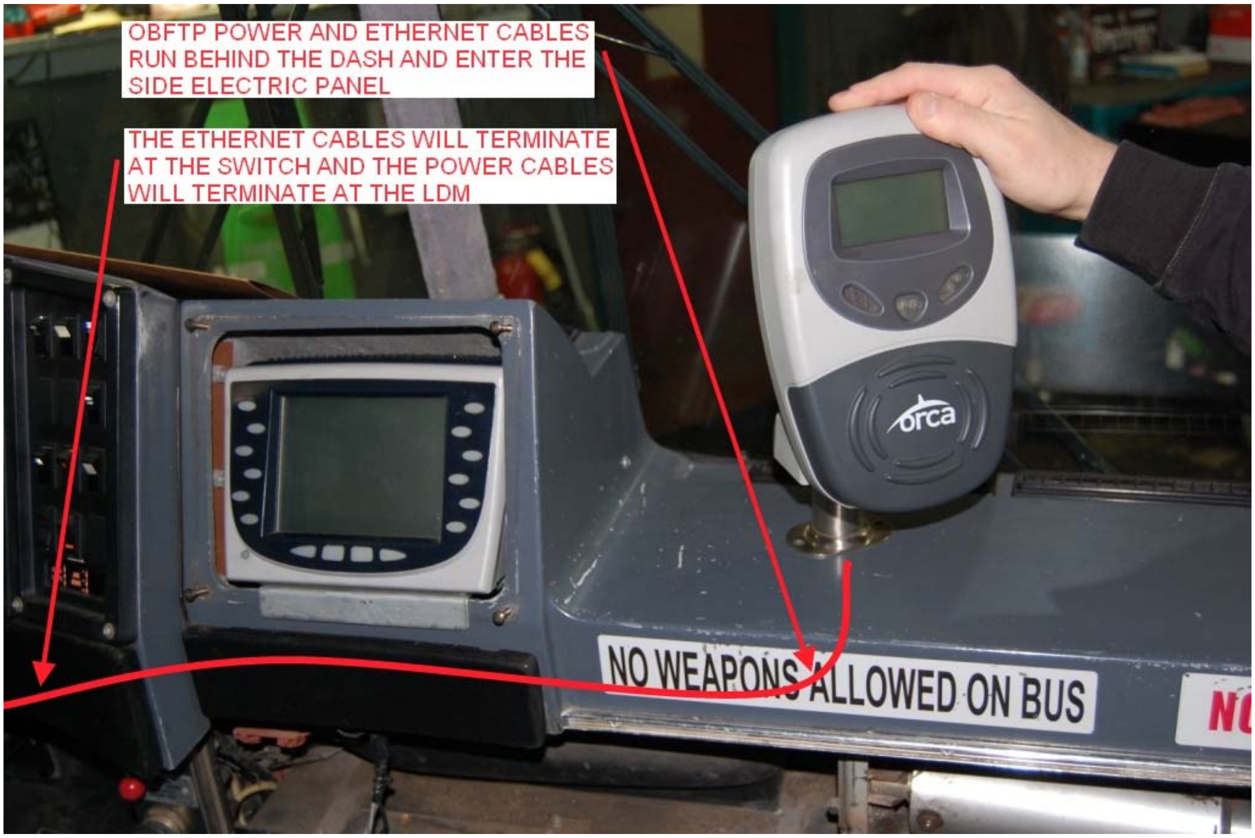
OBFTP POWER AND ETHERNET CABLES RUN BEHIND THE DASH AND ENTER THE SIDE ELECTRIC PANEL
THE ETHERNET CABLES WILL TERMINATE AT THE SWITCH AND THE POWER CABLES WILL TERMINATE AT THE LDM
orca
NO WEAPONS ALLOWED ON BUS

Figure 11: OBFTP Power and Ethernet Cable Route

3.4 WDOLS and Ethernet Switch Cabling Installation

Power for the WDOLS and Ethernet Switch will be run from the LDM; one cable from the LDM will supply power for both the Ethernet Switch and the WDOLS. An Ethernet cable will be used to join the Ethernet Switch to the Cisco Power Injector.

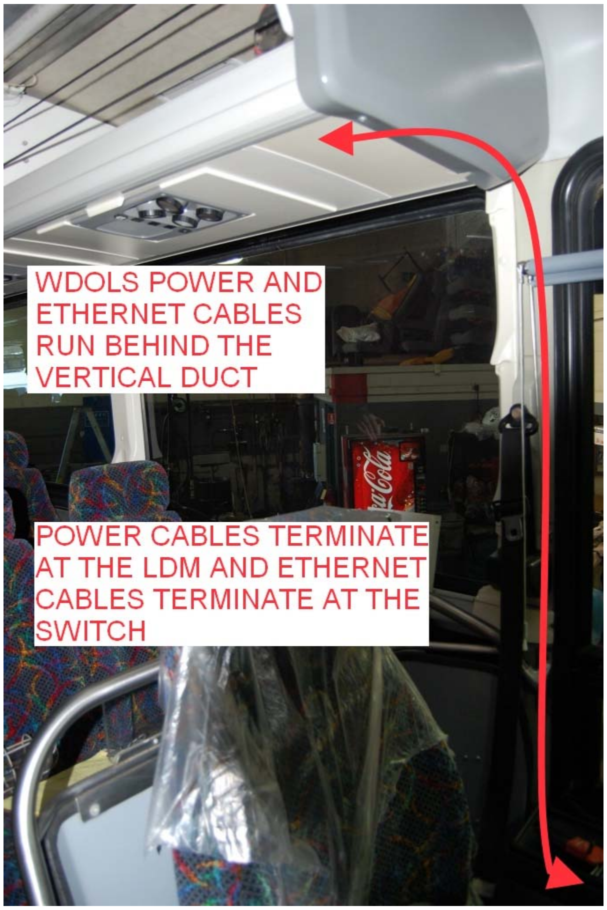
WDOLS POWER AND ETHERNET CABLES RUN BEHIND THE VERTICAL DUCT
POWER CABLES TERMINATE AT THE LDM AND ETHERNET CABLES TERMINATE AT THE SWITCH

Figure 12: WDOLS Cable Route

3.4.1 Power and Ethernet Cabling

1. Run the power cable from the LDM to the Ethernet Switch. Terminate the cable in the Ethernet Switch connector, and run an additional twelve feet of cable from the connector to the WDOLS. Terminate the WDOLS power connector and insert the connector into the Cisco Power Injector.
2. Cut thirteen feet of Ethernet cable and terminate to the specifications detailed in SEA-02088 Generic On-Board Installation Instruction [2].

3.4.2 Antenna Cabling

After the antenna is installed, route the cable from the overhead access panel along the roof cavity to the WDOLS mounted on the overhead panel.